

Comparative Analysis of Perceived Learning Effectiveness Between Online and Face-to-Face Internships of BS Medical Technology Students

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Received: 23 Jul 2025,

Received in revised form: 19 Aug 2025,

Accepted: 24 Aug 2025,

Available online: 29 Aug 2025

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Keywords— *clinical skills, face-to-face internship, learning effectiveness, online internship, professional preparedness, BS Medical Technology*

Abstract— *The study aimed to compare the perceived learning effectiveness of online and face-to-face internships among BS Medical Technology students at the World Citi College. A quantitative-comparative research design was employed, with a total of 210 respondents from two distinct internship batches: 60 students from the Academic Year 2020–2021 who underwent online internships, and 150 students from the Academic Year 2023–2024 who completed face-to-face internships. Data were collected using a structured survey questionnaire measuring knowledge acquisition, skills development, problem-solving, critical thinking, communication, and professional preparedness. Descriptive statistics were used to present demographic profiles and perceived effectiveness, while independent samples t-tests determined significant differences between the two groups. Results revealed that face-to-face internship students consistently reported higher mean scores across all indicators of learning effectiveness compared to online interns. Statistically significant differences were observed in knowledge acquisition, skills development, problem-solving, critical thinking, communication, and professional preparedness, indicating that traditional internships provide more comprehensive experiential learning. While online internships ensured continuity of training during pandemic-related restrictions, they were limited in offering hands-on practice and direct mentorship. These findings highlight the importance of maintaining face-to-face internships as a core component of medical technology education while considering online modalities as supplemental tools to support theoretical learning. The study suggests that hybrid internship models may optimize both accessibility and practical skill development for future healthcare professionals.*

I. INTRODUCTION

The internship is an essential component of medical education, serving as the bridge between theoretical knowledge and practical application. It allows students to acquire clinical competencies, interpersonal skills, and professional experiences that cannot be fully gained in classroom settings. Traditional internships are typically characterized by direct patient interactions, hands-on

training, and face-to-face mentorship, which are considered vital in shaping clinical judgment and preparedness for professional practice [1]. However, the COVID-19 pandemic disrupted conventional training models and accelerated the transition toward online platforms, raising questions about the overall effectiveness of digital learning in medical training [2][3].

Previous studies have highlighted the importance of adapting internship programs to ensure continuity in medical education during periods of disruption. Webinars and virtual simulations, for instance, were rapidly adopted to substitute clinical exposure, and these methods have been recognized as feasible and effective alternatives for maintaining academic engagement [2][3]. Digital platforms such as WeChat have further demonstrated the potential of integrating problem-based and case-based learning with interactive review methods, thereby enhancing student participation and learning outcomes in online internships [4]. Despite these innovations, it is also necessary to consider cultural and contextual factors, as they influence students' attitudes and professional development during their internship experiences [1].

The purpose of this study is to conduct a quantitative analysis of the perceived learning effectiveness between online and traditional internships among medical technology students. By comparing these two modalities, the paper aims to provide evidence on which approach offers more comprehensive learning opportunities. Furthermore, this study contributes to the growing body of research on medical education by addressing how online and face-to-face internship formats impact skill acquisition, critical thinking, and overall preparedness for professional practice in the post-pandemic educational landscape.

1.1 Traditional Internship and Clinical Competence

Traditional internships are regarded as a cornerstone of medical and allied health education, as they provide students with structured opportunities to integrate theoretical knowledge into real-world clinical practice. Almadani et al. [5] emphasized that nurse interns perceive clinical preparation and readiness as essential factors that directly influence their confidence and competence in clinical settings. This suggests that early and comprehensive preparation before entering internships enhances students' ability to adapt to the professional environment and handle patient care responsibilities effectively. Moreover, the traditional learning approach, when coupled with interactive learning activities, has been shown to positively impact both the personal and professional growth of interns. AlKhaibary et al. [6] highlighted that conventional clinical exposure plays a significant role in improving problem-solving abilities, communication, and teamwork, which are critical in ensuring successful transitions into professional nursing practice. These findings reinforce the value of hands-on experiences, where students not only refine technical skills but also cultivate professional behaviors that classroom instruction alone cannot achieve.

In addition, the role of clinical teaching faculty is vital in ensuring the effectiveness of traditional internships. Song et al. [7] established a framework of qualities for clinical teaching faculty, underscoring the importance of mentorship, guidance, and structured supervision in undergraduate medical internships. Their findings indicate that the presence of competent faculty enhances learning outcomes by fostering clinical reasoning, skill acquisition, and reflective practice among students. Collectively, these studies affirm that traditional internships, supported by strong preparation, interactive activities, and effective teaching faculty, remain indispensable in developing clinical competence among healthcare students.

1.2 Effectiveness of Online and Virtual Internships

The COVID-19 pandemic accelerated the adoption of online and virtual internship models in medical and health-related education. Hao et al. [8], through a systematic review, found that digital education offered an effective alternative to conventional training, ensuring that undergraduate nursing and medical interns continued their academic progression despite restricted clinical exposure. The study emphasized that virtual platforms enhanced knowledge acquisition, improved flexibility, and supported the development of essential competencies, although challenges such as limited hands-on practice remained. Similarly, Alsaywid et al. [9] reported that institutional preparedness played a significant role in the success of online medical training during the pandemic. Their study in Saudi Arabia highlighted that e-learning methods, when effectively designed and implemented, were perceived as both effective and adaptable for residents' medical training. However, the authors also noted that digital fatigue, reduced clinical engagement, and disparities in technological access posed significant barriers to maximizing the benefits of online internships.

Beyond the pandemic context, Feldman [10] argued that virtual internships may serve as a sustainable complement to traditional internship models. By providing opportunities for remote collaboration, professional networking, and exposure to global learning environments, virtual internships expand the scope of experiential learning. Nevertheless, the study cautioned that online training should not entirely replace hands-on clinical practice, but rather be integrated as a hybrid model to maximize both accessibility and skill development. Together, these findings suggest that online and virtual internships, while not without limitations, are effective alternatives that ensure continuity of medical education in times of disruption.

1.3 Cultural and Contextual Influences on Internship Learning

For medical technology students, cultural and contextual factors shape not only their motivation but also their preparedness for professional practice. Veselova et al. [11] demonstrated that cultural exposure during internships enhances student engagement and fosters motivation, which can be paralleled in medical technology programs. Exposure to diverse patient populations, healthcare practices, and professional values during internships can enrich med tech students' perspectives, motivating them to integrate both technical expertise and cultural sensitivity into their clinical training. The COVID-19 pandemic further highlighted the influence of contextual factors on health-related internship experiences. Duprez et al. [12] reported that nursing students' commitment to their education was affected by how their internships were structured during the pandemic. For medical technology students, similar challenges emerged: limited access to laboratory facilities, reduced patient interactions, and decreased opportunities for hands-on practice likely impacted both skill acquisition and professional identity formation. These contextual barriers underscore the need to create supportive learning environments that sustain students' motivation and ensure continuity of competence development, even in times of disruption.

Cultural competence also plays a critical role in preparing medical technology students for professional practice. Arruzza and Chau [13] emphasized that cultural competence education improves knowledge acquisition, performance, and student satisfaction in health sciences. Applied to med tech internships, fostering awareness of cultural diversity in laboratory and clinical settings ensures that students are not only technically skilled but also able to work effectively in multidisciplinary teams and serve diverse patient populations. Hence, cultural and contextual influences remain essential components of internship design, ensuring that medical technology students develop both professional competence and adaptability in a rapidly changing healthcare landscape.

II. METHODOLOGY

2.1 Research Design

This study employed a quantitative-comparative research design to determine the perceived learning effectiveness between online and traditional internships of BS Medical Technology students. This design was chosen because it allows the comparison of two distinct groups—students who underwent face-to-face internships and those who

experienced online internships—using measurable indicators of academic and professional effectiveness.

2.2 Research Locale and Respondents

The study was conducted at the World Citi College. The respondents were BS Medical Technology interns from two distinct batches. The Academic Year 2020–2021 interns (Group A) underwent an online internship setting due to restrictions brought by the COVID-19 pandemic, while the Academic Year 2023–2024 interns (Group B) completed a traditional, face-to-face internship setting.

A total of 210 respondents participated in the study, consisting of 60 interns from Group A (online internship) and 150 interns from Group B (face-to-face internship). A purposive sampling technique was employed to ensure that only students who had fully completed their respective internship programs during the specified academic years were included in the study.

2.3 Research Instrument

Data were collected using a structured survey questionnaire designed to measure the perceived learning effectiveness of the respondents. The instrument consisted of two main sections: (1) demographic profile, and (2) indicators of learning effectiveness, which included knowledge acquisition, skills development, problem-solving and critical thinking, communication, and professional preparedness. The instrument was validated by experts in medical technology education to ensure clarity, relevance, and reliability.

2.4 Data Gathering Procedures

Prior to data collection, formal approval was sought from the institution and research adviser. The survey questionnaire was distributed to the respondents of both groups. For the online internship group (AY 2020–2021), questionnaires were distributed via online platforms, while for the face-to-face internship group (AY 2023–2024), distribution was conducted in person after securing proper coordination with faculty supervisors. Participation was voluntary, and informed consent was obtained from all respondents. Responses were collected within a one-month period and subsequently encoded for analysis.

2.5 Data Analysis

The data gathered were analyzed using descriptive and inferential statistics. Descriptive statistics, such as frequency counts, percentages, mean scores, and standard deviations, were used to present the demographic profile and perceived effectiveness ratings. To determine whether significant differences existed between the two groups, an independent samples t-test was performed at a 0.05 level of significance.

2.6 Ethical Considerations

The researchers ensured strict compliance with ethical research standards. Informed consent was obtained from all participants, and they were informed of their right to withdraw from the study at any time. The confidentiality and anonymity of all respondents were protected, as no identifying information was collected. Data were used strictly for academic purposes and in accordance with institutional ethical guidelines.

III. RESULTS AND DISCUSSIONS

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Table.1: Demographic Profile

Sex	Frequency (f)	Percentage
Female	82	39.05%
Male	128	60.95%
Total	210	100%

The data in Table 1 shows that the majority of the respondents were female, comprising 128 or 60.95% of the total population, while male respondents accounted for 82 or 39.05%. This indicates that female students dominate the Medical Technology internship program in World Citi College, which reflects the common trend in allied health sciences where female enrollment tends to be higher compared to male counterparts.

Table.2: Frequency and Percentage Distribution of the Respondents in Terms of Age

Age Range	Frequency (f)	Percentage
20-21	68	32.38%
22-23	102	48.57%
24-24	35	16.67%
26 and above	5	2.38%
Total	210	100%

The data in Table 2 reveals that the majority of the respondents were within the age range of 22–23 years old, accounting for 102 or 48.57% of the total population. This is followed by those aged 20–21 years old with 68 or 32.38%, while 35 or 16.67% of the respondents were in the 24–25 age group. Only a small proportion, 5 or 2.38%, were aged 26 and above. This distribution suggests that most of the Medical Technology interns from World Citi College were in their early twenties, which aligns with the typical age of students completing undergraduate internship requirements.

Table.3: Frequency and Percentage Distribution of the Respondents in Terms of Internship Type

Exposure to Health Related Seminars/Training	Frequency (f)	Percentage
Yes	135	64.29%
No	75	35.71%
Total	210	100%

Table 3 shows that a majority of the respondents (64.29%) had exposure to health-related seminars or trainings, while 35.71% did not. This implies that most Medical Technology interns had prior opportunities to enhance their knowledge and skills through supplemental learning experiences, which may have contributed to their internship performance and readiness.

Table.4: Frequency and Percentage Distribution of the Respondents in Terms of Exposure to Health-related Seminars or Trainings

Internship Type	Frequency (f)	Percentage
Face-to-Face (2023-24)	150	71.43%
Online (2002-21)	60	28.57%
Total	210	100%

Table 4 shows that a larger proportion of respondents, 150 or 71.43%, experienced face-to-face internship, while 60 or 28.57% underwent online internship. This distribution reflects the transition from traditional to online internship

during the COVID-19 pandemic, highlighting the shift in training modalities between different academic years.

Table.5: Shapiro–Wilk Test for Normality of the Variables

Variable	W Statistics	p-Value	Interpretation
Knowledge Acquisition	0.981	0.087	Normally Distributed
Skills Development	0.976	0.094	Normally Distributed
Problem Solving	0.972	0.072	Normally Distributed
Critical Thinking	0.968	0.041	Not Normally Distributed

Communication	0.983	0.067	Normally Distributed
Professional Preparedness	0.979	0.082	Normally Distributed

Table 5 presents the Shapiro–Wilk test results assessing the normality of the variables measuring learning effectiveness. With the exception of critical thinking ($p = 0.041$), all indicators yielded p-values greater than 0.05, suggesting that their distributions do not significantly deviate from normality. Thus, assumptions for parametric testing are satisfied for most variables, supporting the use of an independent samples t-test to compare the two groups. However, for variables not meeting normality assumptions, non-parametric alternatives may be considered to validate findings.

Table.6: Comparative Analysis of Perceived Learning Effectiveness Between Online and Face-to-Face Internship Groups

Indicators of Learning Effectiveness	Group A (Online)	Group B (Face-to-Face)	t-value	p-value	Interpretation
Knowledge Acquisition	3.65(0.72)	4.12(0.68)	-4.21	0.000	Significant
Skills Development	3.58(0.75)	4.25(0.63)	-5.18	0.000	Significant
Problem Solving	3.60(0.70)	4.05(0.65)	-3.84	0.000	Significant
Critical Thinking	3.55(0.80)	3.98(0.71)	-3.12	0.002	Significant
Communication	3.70(0.74)	4.15(0.60)	-3.87	0.000	Significant
Professional Preparedness	3.50(0.78)	4.20(0.66)	-5.35	0.000	Significant

Table 6 shows the results of the independent samples t-test comparing the perceived learning effectiveness of online and face-to-face internship groups. Across all six indicators—knowledge acquisition, skills development, problem-solving, critical thinking, communication, and professional preparedness—the face-to-face internship group reported significantly higher mean scores than the online internship group ($p < 0.05$ for all variables). These findings suggest that traditional, face-to-face internships provided more effective learning experiences for BS Medical Technology interns compared to online internship settings.

3.6.1.: Knowledge Acquisition

As shown in Table 6, the test rejects the null hypothesis since the p-value (0.000) is less than $\alpha = 0.05$. Therefore, there is a statistically significant difference in the perceived learning effectiveness on knowledge acquisition between the two groups ($t = -4.21$, $p < 0.001$). Group A (Online Internship) reported a mean of 3.65 (Moderately Effective), while Group B (Face-to-Face Internship) obtained a higher mean of 4.12 (Very Effective). This finding suggests that face-to-face internships provide stronger opportunities for Medical Technology interns to directly apply theoretical concepts in actual clinical settings, which enhances comprehension and long-term retention.

These results are consistent with studies emphasizing that experiential and hands-on learning fosters deeper knowledge integration compared to remote or simulated experiences. In the health sciences, direct engagement with laboratory procedures, diagnostic tools, and patient samples promotes a more comprehensive understanding of applied theories [14]. Furthermore, authentic practice settings allow for real-time feedback and clarification from supervisors, strengthening knowledge acquisition and reducing misconceptions that may arise in virtual environments [15].

3.6.2.: Skills Development

Table 6 shows that the null hypothesis is rejected since the p-value (0.000) is less than $\alpha = 0.05$. A significant difference was found in the perceived development of skills between the two groups ($t = -5.18$, $p < 0.001$). Group A (Online Internship) obtained a mean score of 3.58 (Moderately Effective), while Group B (Face-to-Face Internship) obtained a mean score of 4.25 (Very Effective). This highlights that traditional internships are more effective in equipping students with the practical skills needed in Medical Technology, particularly those requiring laboratory competence and manual precision.

According to earlier research, hands-on training remains critical in medical and laboratory education, as it allows students to practice techniques that cannot be fully replicated in online modules [16]. Moreover, immediate access to mentors and clinical instructors provides students with corrective guidance and skill refinement, which is often limited in virtual settings [17]. Thus, the superiority of face-to-face internships in skill development is strongly supported by both the statistical results and existing literature.

3.6.3.: Problem Solving

As presented in Table 6, the null hypothesis is rejected since the p-value (0.000) is less than $\alpha = 0.05$. A significant difference exists in problem-solving effectiveness between the two groups ($t = -3.84$, $p < 0.001$). Group A (Online Internship) had a mean score of 3.60 (Moderately Effective), while Group B (Face-to-Face Internship) reported a higher mean of 4.05 (Very Effective). This suggests that face-to-face internships provide richer opportunities for students to engage in diagnostic reasoning and case-based problem-solving.

The literature supports this result, noting that problem-solving skills are better developed when students are exposed to unpredictable clinical situations that require immediate analysis and intervention [18]. Additionally, real-world settings allow collaboration with peers and supervisors, which fosters collective problem-solving and enhances cognitive flexibility—capabilities that are more

difficult to cultivate in online simulations [14]. Thus, traditional internships create a learning environment where interns actively confront and resolve authentic challenges.

3.6.4.: Critical Thinking

Table 6 indicates that the null hypothesis is rejected since the p-value (0.002) is less than $\alpha = 0.05$. Therefore, a significant difference is observed in critical thinking between the two groups ($t = -3.12$, $p = 0.002$). Group A (Online Internship) reported a mean of 3.55 (Moderately Effective), while Group B (Face-to-Face Internship) reported a higher mean of 3.98 (Very Effective). This demonstrates that traditional internships strengthen the ability of Medical Technology students to think critically and evaluate complex cases.

Consistent with previous studies, exposure to actual laboratory workflows and patient-related scenarios helps students apply reflective judgment and higher-order reasoning [15]. Moreover, clinical practice enhances their decision-making by requiring them to weigh multiple variables under time pressure, thereby sharpening their analytical skills [16]. By contrast, online training—while effective in transmitting theoretical content—tends to offer structured and predictable scenarios, which limits the development of adaptive critical thinking.

3.6.5.: Communication

As reflected in Table 6, the test rejects the null hypothesis since the p-value (0.000) is less than $\alpha = 0.05$. A significant difference in communication skills exists between the groups ($t = -3.87$, $p < 0.001$). Group A (Online Internship) obtained a mean score of 3.70 (Moderately Effective), while Group B (Face-to-Face Internship) achieved a higher mean of 4.15 (Very Effective). These findings highlight that direct interpersonal interaction during traditional internships contributes significantly to the development of effective communication.

According to research, communication in clinical training is best cultivated in face-to-face contexts where students can practice professional dialogue with patients, collaborate with healthcare teams, and receive feedback on their communication style [17]. Furthermore, studies emphasize that non-verbal cues and professional etiquette—key components of effective healthcare communication—are best learned through in-person observation and participation [18]. This underscores why students in face-to-face internships reported stronger outcomes in communication development.

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IV. CONCLUSION

This study demonstrated that face-to-face internships are more effective than online internships in enhancing the perceived learning effectiveness of BS Medical Technology students at the World Citi College. Students in traditional internships reported higher levels of knowledge acquisition, skills development, problem-solving, critical thinking, communication, and professional preparedness. While online internships provided continuity of learning during pandemic restrictions, they were limited in offering hands-on practice and direct mentorship. These findings suggest that traditional internships remain essential for developing practical competencies and professional readiness, though online modalities can serve as a complementary tool to support theoretical learning. Institutions may consider hybrid approaches to maximize both accessibility and experiential learning opportunities.

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